



Taking an Alternative Route

A guide for fleet operators and individual owners using alternative fuels in cars and trucks



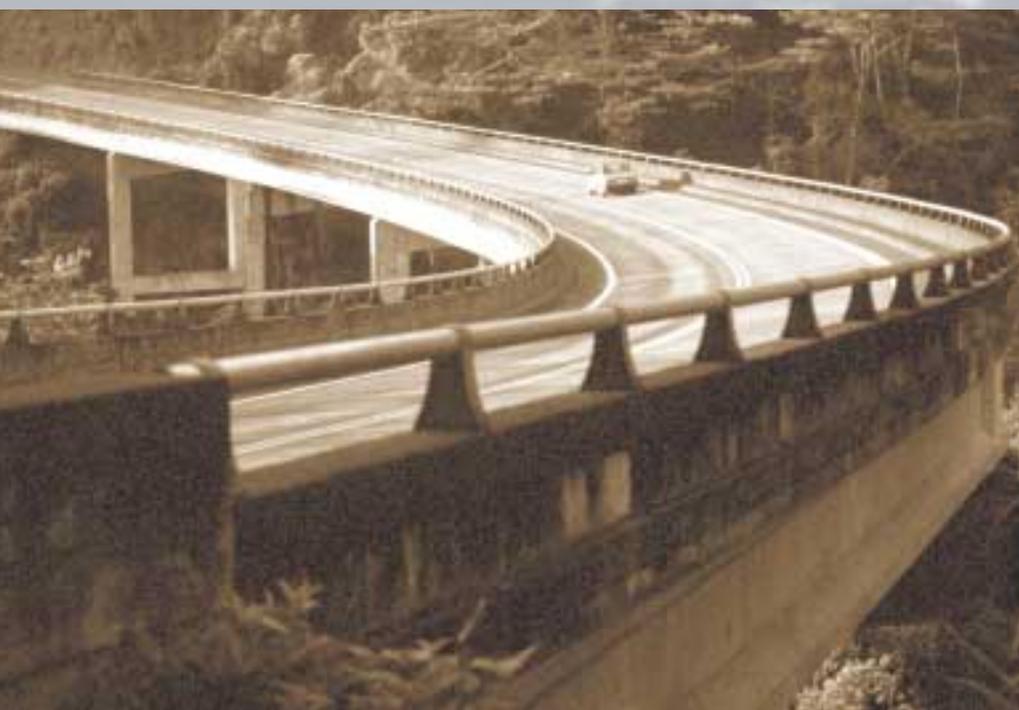


Only a few years ago, the idea of cars fueled with something other than gasoline sounded like a (tail)pipe dream.

The possibility of vehicles running on alternatives to conventional gasoline and diesel fuel seemed little more than an intriguing thought.

Now, it's safe to say that we've come a long way in a short time. Hundreds of thousands of vehicles powered by alternative fuels are on our roads and more are joining them every day.

Taking an Alternative Route



The United States consumes more than one-fourth of the world's oil, yet produces only about one-tenth of it. The transportation sector currently accounts for approximately two-thirds of all U.S. petroleum use and roughly one-fourth of total U.S. energy consumption. There is nearly a one-to-one relationship between additional gasoline consumption and the nation's increased use of imported oil.

Currently, America spends approximately \$100 billion per year to import more than 50% of its oil. Domestic oil production has drastically declined, taking with it more than 25% of the jobs that existed in this sector in the early 1980s.

Increased use of domestically produced alternative fuels would enable us, as a nation, to gain greater control of our energy resources and fuels. There's a potential economic benefit, too. Reduction in oil imports could mean growth in the domestic economy, with new jobs, if these alternative fuels replace imported petroleum.

On the environmental front, many Americans living in metropolitan areas face possible chronic damage to their health from long-term exposure to air pollutants. Emissions from the 200 million cars and trucks in this country account for about half of all air pollution and more than 80% of urban air pollution. About 62 million people—almost a quarter of the U.S. population—live in areas that violate federal public health standards for clean air.

Smog is one of the most obvious forms of air pollution that can hang over cities during the hot days of summer. Smog consists

primarily of ozone, and cars produce a major share of the pollutants that form ozone. The good news is that newer cars

produce lower amounts of harmful emissions than do older cars, and most alternative fuel vehicles produce even less.❖



New Directions, New Choices

Concern about the environment and our country's dependence on imported petroleum is hastening the development of new domestic sources of power for vehicles, as well as new vehicle technologies.

Now that a new century is upon us, a new road is being built in America—a road leading to reduced national dependence on conventional petroleum fuels for transportation. Legislation enacted in the 1990s is accelerating the use of alternatives to conventional gasoline and diesel fuels.

In particular, fleet operators need to be aware of two federal laws—the 1990 Clean Air Act Amendments (CAAA) and the Energy Policy Act of 1992 (EPAAct)—which already require certain fleets to acquire vehicles that operate on alternatives to petroleum.

CAAA seeks to improve air quality across the country. The law includes several programs requiring the use of cleaner fuels to reduce mobile source pollutants. Among these programs is the Clean Fuel Fleet Program (CFFP) administered by the U.S. Environmental Protection Agency (EPA). This program requires fleets in metropolitan areas with high ozone and/or carbon monoxide levels to acquire clean fuel vehicles (CFVs)—vehicles that meet stricter emission standards than otherwise required by law. Fleets can use any fuel, including alternative fuels, as long as the vehicles acquired are certified to meet the EPA low emission vehicle (LEV) standards or better.

In contrast, EPAAct's primary purpose is to increase energy security through energy conservation and increased use of domestic alternative fuels. EPAAct directs the U.S. Department of Energy (DOE) to implement a program requiring certain fleets in larger metropolitan areas to acquire alternative fuel vehicles (AFVs). Although EPAAct does not mandate that the required vehicles exhibit lower emissions, most AFVs that meet EPAAct requirements do produce lower emissions and meet the CFFP emission standards.

DOE has prepared this guide to help you determine whether your fleet is covered by CAAA and EPAAct, and to provide information on available alternative fuels and vehicles. With this information, fleets can shorten the time it takes to improve air quality and pave our nation's road to energy independence by using AFVs certified to meet EPA's Clean Fuel Fleet standards as well as the mandated EPAAct requirements.❖

Is Your Fleet Covered by EPAAct or CAAA?

In passing CAAA and EPAAct legislation, Congress recognized that because fleets typically accumulate higher annual mileage than private vehicles, are often centrally refueled, and are replaced sooner, fleet vehicles are uniquely suited for introducing new fuel and vehicle technologies. Your fleet may be covered by EPAAct, the CFFP provisions of CAAA, or both, and answering the questions below will help you decide.



To What Type of Organization Do You Belong?

In 1992, EPAAct requirements affected only federal government fleets. In 1996, DOE extended the regulations to cover state government fleets and fleets of alternative fuel provider companies "sufficiently involved with alternative fuels" (see Glossary for definition). These requirements took effect in model year 1997.

EPAAct also gives DOE the authority to require private and municipal fleets to comply with the regulations if it finds that goals for displacing petroleum-based fuels with alternative fuels are not being met through mandatory purchases by federal, state, and fuel provider fleets. As of this writing, DOE is reviewing this option through its rulemaking process. More information on the status of this process can be found on the DOE Office of Transportation Technologies' Web site at www.ott.doe.gov/epact/private_fleets.html.

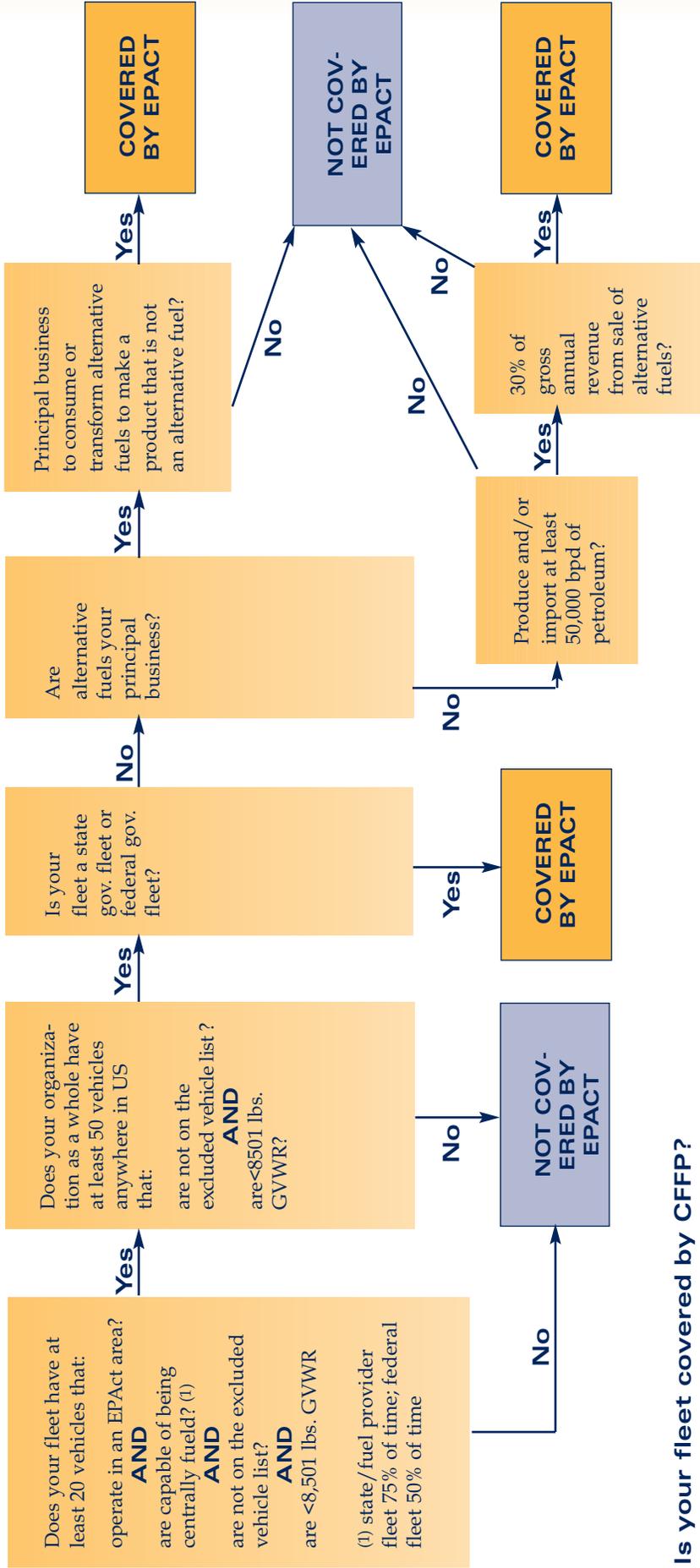
In contrast, the CFFP requirements took effect in model year 1999 and apply to all types of fleets within the designated metropolitan areas, whether operated by a private company or a government agency.

Where Does Your Fleet Operate?

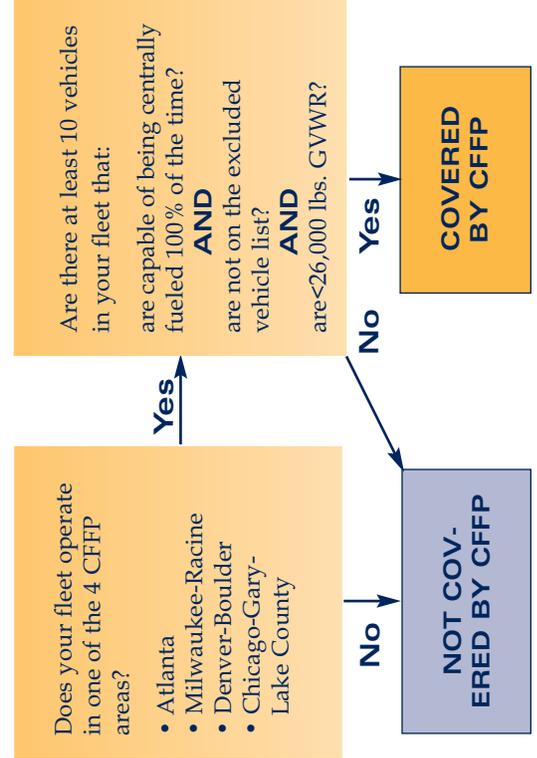
Both laws apply to large metropolitan areas, termed metropolitan statistical areas (MSAs) and consolidated metropolitan statistical areas (CMSAs), with populations of 250,000 or more (as reported in the 1980 U.S. Census). The EPA regulations target counties that constitute an MSA or a CMSA according to the 1980 U.S. Census. The DOE bases its list of constituent

Determining if Your Fleet is Covered by EPACT or the CFFP

4 Is your fleet covered by EPACT?



Is your fleet covered by CFFP?



Excluded Vehicle List

Vehicles that are:

- Held for lease or rental to the general public
- Held for sale by dealers, including those used for demonstrations
- Used by original equipment manufacturers (OEMs) for product evaluations or tests
- Used in law enforcement
- Used for farm and construction purposes or operated in industrial, commercial, marine, rail, or airport facilities (called "non-road")
- Used for military purposes and certified for national security. (EPACT only: Vehicles normally parked at a personal residence when not in use.)

counties for each MSA or CMSA on the 1990 U.S. Census definitions.

CAAA gave the 23 metropolitan areas targeted by the law the option of implementing CFFP or developing other programs that would yield similar emissions benefits. Of these 23 metropolitan areas, four—Atlanta, Milwaukee-Racine, Chicago-Gary-Lake County, and Denver-Boulder—have decided to participate in CFFP. To determine whether your fleet operates in one of these covered areas, contact one of the following individuals:

Atlanta, Georgia:

William Cook
Department of Natural Resources
Environmental Protection Division
Mobile & Area Sources Program
Engine and Fuels Unit
Atlanta Tradeport, Suite 136
4244 International Parkway
Atlanta, GA 30354

Telephone: 404-362-2781
Email: william_cook@mail.dnr.state.ga.us or Marlin Gottschalk at 404-363-7024

Milwaukee-Racine, Wisconsin:

Muhammad Islam
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
Telephone: 608-264-9219, or visit www.dnr.state.wi.us/org/aw/air/reg/cff/cff.htm

Chicago-Gary-Lake County, Illinois/Indiana:

Illinois:
Darwin Burkhart
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276
Telephone: 217-524-4343
Email: epa2117@epa.state.il.us

Indiana:

Letty Zepeda
Indiana Department of Environmental Management
504 North Broadway
Gary, IN 46402
Telephone: 219-881-6726

Denver-Boulder, Colorado:

Michael O'Toole or
Macie LaMotte
Colorado Department of Public Health & Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530
Telephone: 303-692-3139

The CMSAs covered by EPA's Act are listed at the back of this document. Because the CMSAs often extend a substantial distance beyond a named city, we have also identified the affected counties in each CMSA.

For CMSAs covered by both laws, EPA and DOE may include different counties within their boundaries. In general:

- If your fleet operates in one of the four CMSAs within a CFFP as listed above, both CAAA and EPA's Act apply.
- If your fleet operates in one of the CMSAs listed in Appendix A, excluding the four with CFFPs, it is covered only by EPA's Act.

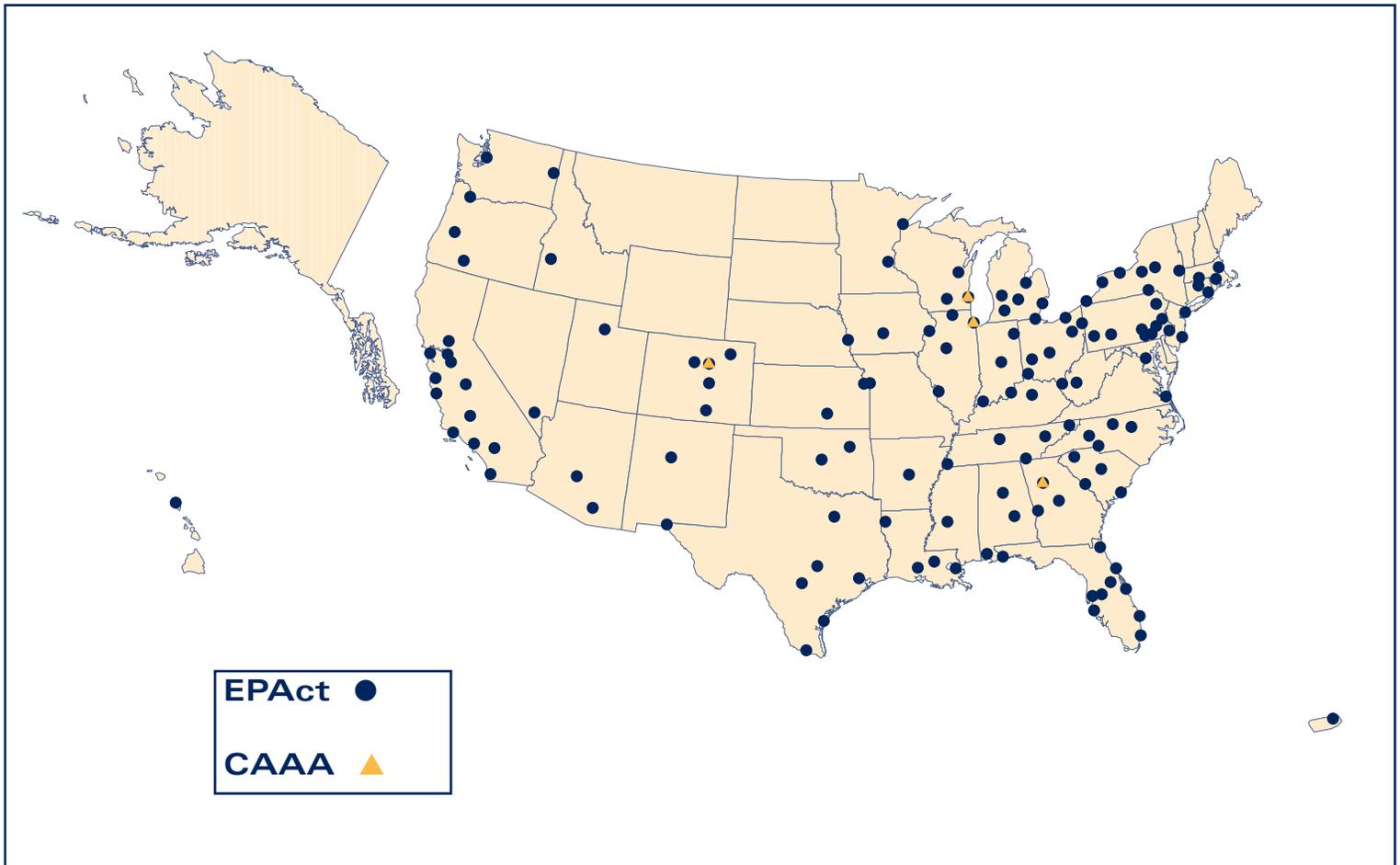
For more information on CAAA's Clean Fuel Fleet Program, call Sally Newstead of EPA at 734-214-4474.

How Is Your Fleet Fueled?

Once you have determined that your fleet is in a covered area, you need to assess its fueling capabilities. If enough vehicles in your fleet are "centrally fueled" or "capable of being centrally fueled," it may be covered by



MSAs and CMSAs Covered by EPAct and CAAA



both EPAct and CAAA. CAAA defines these terms to mean a fleet or part of a fleet that can be fueled 100% of the time at a location owned, operated, controlled by, or under contract with the covered fleet operator. The EPAct definition is phrased as 75% of the time.

How Many and What Types of Vehicles Make Up Your Fleet?

EPAct applies to organizations that control 50 or more covered vehicles within the United States, at least 20 of which are used primarily within a designated MSA or CMSA and are capable of being centrally fueled at least 75% of the time. CAAA applies to organizations

with at least 10 vehicles that are operated in an MSA or CMSA and are capable of being centrally fueled 100% of the time.

Only vehicles within specific size ranges are covered by the two laws, and therefore must be counted in determining whether you are covered. EPAct requirements apply only to light-duty vehicles (LDVs)--those with a gross vehicle weight rating (GVWR) of 8,500 lb or lower. The CFFP requirements cover LDVs and heavy-duty vehicles (HDVs) with a GVWR lower than 26,000 lb.

How a vehicle is used also determines whether it is covered or excluded. These vehicle uses are not covered under either EPAct or CAAA:

- Held for lease or rental to the general public
- Held for sale by dealers, including those used for demonstrations
- Used by original equipment manufacturers (OEMs) for product evaluations or tests
- Used in law enforcement
- Used in emergencies
- Used for military purposes and certified for national security.

Vehicles normally parked at personal residences when not in use are also excluded from consideration by EPAct.

For more information go to www.fleets.doe.gov, or call the National Alternative Fuels Hotline at 800-423-1DOE❖

Requirements for Covered Fleets

If you've determined that your fleet is covered by CFFP or EPAAct regulations, a certain percentage of your annual vehicle acquisitions must meet requirements set forth in the laws.

How Many AFVs Are You Required to Buy, and When?

If your fleet is covered by one or both programs, you must determine how many qualified vehicles you must acquire. To do this, first determine the number of covered acquisitions made by the fleet during the model year, then multiply that total by the percentage requirement of CFVs or AFVs for that year (see Table 1).

The term "acquiring a vehicle" is broadly defined by both programs as purchasing, leasing, or otherwise gaining possession or control of a vehicle. The laws cover acquisitions of vehicles that 1) are in the appropriate weight class; 2) do not have an excluded vocation (use); and 3) are capable of being centrally fueled. The CFFP further stipulates that the acquired vehicle must accumulate more than 50% of its annual mileage in the covered area.

The two laws use different schedules of acquisition requirements for the applicable vehicles.

Fleets covered by both EPAAct and CAAA will be required to conform to both laws; acquisitions of AFVs that meet CFFP emission standards count in both programs. The annual CFFP requirement calculation must be done separately for LDVs and HDVs since the requirements for each class differ.

Which Fuels Can You Use?

The original EPAAct legislation designated the following as alternative fuels:

- 100% methanol, denatured ethanol, and other alcohols
- Mixtures containing 85% or more by volume of methanol, denatured ethanol, or other alcohols with gasoline or other fuels
- Natural gas
- Liquefied petroleum gas (propane)
- Hydrogen
- Coal-derived liquid fuels
- Fuels (other than alcohol) derived from biological materials, such as pure biodiesel fuel
- Electricity.

The law also gave DOE the authority to designate additional fuels as alternative fuels as long as they were substantially not petroleum and could demonstrate substantial energy security and environmental benefits. So far, only three formulations of the "P-series fuels" have met the criteria. These fuels are designed to operate in flexible-fuel vehicles that can run on E85 (85% ethanol mixed with 15% gasoline) or gasoline, or any blend of the two.

Because CAAA's purpose is to improve air quality, any fuel/vehicle combination capable of meeting the CFFP standards is acceptable. This includes all alternative fuels as well as conventional and reformulated gasoline, and diesel and clean diesel fuels.

How To and Transfer Credits

Both CFFP and EPAAct include credit programs that allow fleets to earn and transfer vehicle acquisition credits. In general, fleets that exceed their annual acquisition requirements receive credits that they can either bank for use against future requirements or transfer (sell, trade, or give away) to other fleets. The credit programs are market driven; that is, the value of any credits being sold is set by the supply of and demand for the credits, rather than by either the CFFP or EPAAct program.

There are a few notable differences between the EPAAct and CFFP credit programs. Since November 13, 1998, EPAAct has allowed fleets to earn credits to meet its requirements by purchasing biodiesel fuel for use in their fleets. The purchase of each 450 gallons of biodiesel

Table 1 - New Fleet Vehicle Purchases Required by EPA/CAAA

1993	CAAA		EPA/CAAA (GVWR 8,500 lb or less)			
Year	GVWR 8,500 lbs or less (% CFVs)	GVWR 8,501–26,000 lb (% CFVs)	Federal ^a (% or# AFVs)	State ^b (% AFVs)	Alternative Fuel Provider ^b (% AFVs)	Municipal/Private ^c (% AFVs)
1993			5,000			
1994			7,500			
1995			10,000			
1996			25%			
1997			33%	10%	30%	
1998			50%	15%	50%	
1999	30%	50%	75%	25%	70%	
2000	50%	50%	75%	50%	90%	
2001	70%	50%	75%	75%	90%	
2002	70%	50%	75%	75%	90%	20%
2003	70%	50%	75%	75%	90%	40%
2004	70%	50%	75%	75%	90%	60%
2005	70%	50%	75%	75%	90%	70%
2006	70%	50%	75%	75%	90%	70%

^aFiscal year for federal fleet acquisition requirements; model year for all others.

^bAs required by 10 CFR Part 490.

^cMay be required by regulations if DOE finds these acquisitions to be necessary.

fuel is awarded one AFV acquisition credit as long as the biodiesel fuel is used as a neat fuel (100% biodiesel fuel). AFV acquisition credits can also be earned with the use of B 20, a blended fuel which is 20% biodiesel. But the purchase must be five times 450 gallons, or 2,250 gallons, to qualify for a one-vehicle credit.

CFFP gives credits to fleets that acquire vehicles certified to cleaner standards than the minimum LEV

standard. It allows credit transfers between all LDV and light-duty truck classes, but not between LDV and HDV classes.

Exemptions from Requirements

Both the CFFP and EPA/CAAA programs allow fleets to apply for waivers or exemptions from requirements if certain conditions related to vehicle and/or fuel availability and business requirements are met. The

fleet may request an exemption for one or more vehicles it has acquired or intends to acquire, and, if granted, the exemption applies for only one model year. EPA/CAAA allows state fleets to apply for an exemption if additional AFV acquisition costs pose an unreasonable financial hardship.

More information on AFVs and CFVs can be found at www.fleets.doe.gov and www.epa.gov/orcdizux/cff.htm. ❖

If You're Not Covered by the Laws. . . Why Purchase AFVs?



If you find that your fleet is not covered by either federal law, other state and local laws may apply, and regulations enacted in the future may come to apply to your fleet as well. DOE, which tracks the most recent information on federal regulations and state and local laws, has established the National Alternative Fuels Hotline (800-423-1DOE) and

the Alternative Fuels Data Center (www.afdc.doe.gov) to disseminate up-to-date regulatory information and much more.

And even if you're not required by law to do so, you may find that adding AFVs to your fleet makes good business sense. Some fleet owners have taken advantage of federal tax incentives offered

(Tables 2 and 3) and have voluntarily purchased AFVs, choosing alternative fuels that suit their locations or business objectives. These fleet owners can promote the use of clean alternative fuels, which has a real public relations value. No matter what their reasons, these fleet owners are gaining valuable experience from using alternative fuels and operating AFVs, while insulating their businesses from the negative effects of potential disruptions to foreign oil supplies.

When buying an AFV, you must be able to choose knowledgeably among your alternatives. As a potential buyer, you should know each fuel's advantages and disadvantages and recognize the need that each fuel addresses. Your best choices will be fuels and vehicles that balance your business objectives against factors such as emissions, fuel and vehicle availability, fueling convenience, range, vehicle capacity, operating performance, cost, and available incentives.

In some areas of the country, legislation requires transportation control measures, such as time-restricted vehicle operation, high-occupancy freeway lanes, and parking restrictions. If you buy and use AFVs that EPA has certified to Inherently Low Emission Vehicle standards, you may enjoy special exemptions from these control measures. However, the availability of these exemptions is controlled by the transportation departments in individual states. AFVs may also receive special credits that exempt your fleet from parts of your state's employee trip reduction programs.

Special Purchase Incentives and Credits

EPA provides tax deductions and credits to defray start-up costs (see Table 2), which are available to all fleets, even those not required by law or regulation to buy AFVs. Other state and local financial incentive programs may be available in your area. For up-to-date information on these programs, funding, financing, and incentives, contact DOE's

National Alternative Fuels Hotline (800-423-1DOE) or visit DOE's Web site at www.fleets.doe.gov.

Fleets that are not covered by a CFFP but are covered by EPA may also be able to earn Clean Fuel Fleet purchase credits if fleet managers buy or lease AFVs (see Table 3). Depending on individual state regulations, however, only vehicles certified by EPA to Clean Fuel Fleet emission standards may

be used for credits. The purchase credits may be transferred or sold to another fleet, banked, or used to offset emissions from new sources within the same geographic area.

Contact Sally Newstead at EPA's National Vehicle and Fuel Emissions Laboratory in Ann Arbor, Michigan (734-214-4474) for further information, or visit www.fleets.doe.gov, and www.epa.gov/orcdizux/cff.htm. ❖

Table 2 - EPA Act Tax Incentives

Tax Incentives	Per AFV Purchased					Per Fueling Site
	By GVWR			Special AFVs		
	Up to 10,000 lb	10,000 to 26,000 lb	Over 26,000 lb	Buses seat 20 or more	Electric vehicles	
Credit**					10% up to \$4,000 per AFV	
Deduction ⁺	Up to \$2,000 per AFV	Up to \$5,000 per AFV	Up to \$50,000 per AFV	Up to \$50,000		Up to \$100,000

*Direct deduction from tax liability. **Vehicle credits and deductions subject to reductions starting 1/1/02

Table 3 - Clean Air Act Purchase Credits Available for LDV and LDT (3750 LVW)+++

Standards	Fuels**	Purchase Credits
Low-emission vehicle, clean fuel vehicle*	CNG, LPG, RFG, Clean Diesel ⁺	1 Purchase credit
Inherently low-emission vehicle* ⁺	CNG	++
Ultra-low-emission vehicle	CNG	2 Purchase credits
Zero-emission vehicle	EV	3 Purchase credits

*Credits can be earned by purchasing additional LEVs.

**Fuels for which new OEM vehicles are available at these emission levels.

⁺RFG and clean diesel satisfy only CAAA requirements.

⁺⁺A subclassification based on evaporative emissions. Credit value is determined by the major classifications - LEV, ULEV, ZEV.

⁺⁺⁺LDT with higher loaded vehicle weight (LVW) may get fractionally higher credits for NLEV and ZEV.

Which AFVs Are Best for Your Business?

Whatever motivates you to purchase AFVs, you should carefully examine the operating characteristics specific to your fleet, then compare those factors against the types of vehicles available and the performance of various alternative fuels. This will lead you to a sound decision about the types of AFVs that are right for your business.



What Types of AFVs are Available?

AFVs have been available in a variety of vehicle classes (see Glossary for a definition of each class) for a number of years. Alternatives to gasoline and diesel fuel include compressed natural gas (CNG) and liquefied natural gas (LNG), electricity, ethanol (E85, E95), methanol (M85, M100), liquefied petroleum gas (LPG, often referred to as propane), and biodiesel.

Here are the types of light-duty vehicles available:

- Dedicated AFVs, designed to operate on only one fuel (for example, CNG)
- Dual-fuel vehicles, designed to operate on an alternative fuel or conventional fuel (either bi-fuel or flex fuel, see glossary)

In addition, medium-duty and heavy-duty AFVs operate in various applications by federal, state, and local government fleets, as well as in private fleets, such as grocery stores and package delivery fleets. More information on the availability of AFVs on the market can be found at <http://www.fleets.doe.gov>.

How Do You Use Your Fleet Vehicles?

To help you choose among alternative fuels, consider these key questions:

- What types of vehicles are in your fleet?
- How are your vehicles used? Long or short trips? How many miles per day or week? Are they driven predominately in the city or on the highway?
- Do your vehicles return to a central facility at the end of each

work day? Could your vehicles be refueled overnight?

- Do your vehicles need substantial room for hauling cargo or passengers?
- What is the average service life of your vehicles?
- What does it cost to replace a vehicle?
- Which fuels are available in your area?
- How much do you pay for fuel for your vehicles?
- What are your vehicle maintenance costs?

Will AFVs Meet Your Fleet's Needs?

Consider these questions to determine whether AFVs make sense for your business.

- Do the original equipment manufacturers (OEMs) offer AFVs that will meet your service needs?
- Are you willing to convert an OEM vehicle to use an alternative fuel if OEM AFVs are not available in the models you need?
- Are warranties available on the AFVs?
- Which alternative fuels are available within reasonable proximity to the fleet?
- Will you consider adding alternative fuel fueling capabilities to your central facility if local fueling stations are not available?
- Will the storage space available in a suitable AFV meet your usage requirements?
- What is the driving range of the AFV you're considering?
- How does the cost of an AFV

compare with the cost of the conventionally fueled vehicle you would be replacing?

- How does the cost of the alternative fuel compare to the cost of conventional gasoline or diesel?
- Is direct funding available to help defray the cost of incorporating AFVs into your fleet? Are tax incentives available?

Vehicle Certification

Any AFV (OEM or conversion) can be used to meet EPA requirements. Any AFV (OEM or conversion) that is also certified by EPA as meeting the Clean Fuel Fleet standards can be used to meet EPA and CAAA requirements. Conventionally fueled vehicles that have been certified by EPA to the Clean Fuel Fleet standards can be

used to meet CAAA requirements, but not EPA requirements.

Among vehicle offerings, OEMs produce some vehicles that meet the CAAA LEV requirements. Conversion companies may convert vehicles or engines previously certified by EPA for operation on gasoline or diesel fuel to operate on alternative fuels. Emissions from the converted vehicle must also meet the LEV requirements before the conversion. To demonstrate this, the conversion company must have the vehicle tested, or have previously done so with a converted vehicle of the same type.

When a vehicle is converted, quality of service can vary, depending on the provider's experience and skills.



If you plan to purchase a converted AFV, ask to see certified emissions results from before and after the conversion to ensure that your new vehicle meets EPA standards. Any vehicle or engine that has been certified as meeting EPA's Clean Fuel Fleet standards should have a label identifying it as such under the hood.

OEM-produced AFVs or engines will carry OEM warranties. Many major automobile manufacturers have Web sites with information on the AFVs they produce. Converted vehicles may carry warranties covered either by the OEM or by a combination of the OEM and the conversion company. Your dealer may have information

on qualified conversion companies and warranties. You may also be able to obtain information on AFV conversion companies from fuel providers.

For information on vehicles that are available for use with a particular fuel, please contact the sources listed.❖



Comparing the Fuels

The following descriptions compare alternative fuels to conventional gasoline or diesel.

To assist you with your comparison, the next section covers the characteristics of six alternative fuels—biodiesel,

electricity, ethanol, methanol, natural gas, and propane. Because of growing interest in other technologies, a section on advanced technology vehicles is also included.

Extensive research continues on alternative fuels and the vehicles that use them, as well as on innovative advanced automotive technologies. Although our descriptions here are limited to fuel and vehicle combinations that are available now, the future looks promising for many others that are currently being developed.❖

Biodiesel Fuel

Fuel Description:

Liquid produced from such renewable sources as vegetable oils, animal fat, and used oil and fats.

Domestic Content of Fuel

- 100%

Fueling

- Fueling is the same as with diesel fuel.

Fuel Availability

- Available in bulk from an increasing number of biodiesel suppliers and petroleum marketers as a B20 (20% biodiesel and 80% petroleum diesel) blend or as pure/neat biodiesel (B100).
- See the National Biodiesel Board Web site at www.biodiesel.org for a list of biodiesel suppliers.

Vehicle Experience

- In the United States, more than 20 million miles have been driven on neat (pure) biodiesel and biodiesel blends.

Operational Performance

- Horsepower, torque, and fuel economy are similar to those for diesel fuel.
- Cetane number is higher than that of conventional diesel fuel.
- B100 meets low-sulfur, low-aromatic clean diesel standards established by the California Air Resource Board.
- Similar practices employed with Number 2 diesel should be used to ensure adequate cold-flow performance in certain climates. This involves blending with Number 1 diesel or using anti-gel additives.

Maintenance and Reliability

- In older vehicles, high-percent blends of biodiesel can effect fuel hoses and pump seals containing certain elastomers. The effect is lessened with lower-percent blends.
- Lubricity is improved over that of conventional diesel fuel.
- Biodiesel-compatible elastomers

(such as hoses and gaskets) are required for use with neat biodiesel and high-percentage biodiesel blends.

- Heaters for fuel tanks and filters may be needed in cold climates.
- All biodiesel (B100) should meet the ASTM provisional specifications before being used (or blended with diesel fuel) to protect equipment and to ensure trouble-free operation.

Safety

- Training required to operate and maintain vehicles is the same as for petroleum diesel.
- Flashpoint is significantly higher than that of conventional diesel fuel.
- Neat biodiesel is nontoxic and biodegradable.
- Biodiesel can be transported, delivered, and stored using the same equipment as for diesel fuel.

Usage

- Neat biodiesel has been designated as an alternative fuel for EPA's programs. In addition, DOE has ruled that covered fleets must meet at least 50% of their vehicle-acquisition requirements with AFVs, for vehicles with a GVWR greater than 8,500 pounds. For biodiesel fuel providers, the requirement is 100%. A covered fleet will be awarded one AFV acquisition for each 450 gallons of biodiesel purchased. To receive credit for an AFV acquisition, the biodiesel must be used in blends that contain, by volume, at least 20% biodiesel.

Costs

- Biodiesel use requires little or no engine modification.
- Neat biodiesel costs range from \$1.95 to \$4.75 per gallon, depending on the feedstock, supplier, and quantity purchased.
- In general, B20 blends will cost 30 to 40 cents more per gallon than diesel.



For More Information, Contact:

- *National Biodiesel Board, 573-635-3893 or 800-BIODIESEL, www.biodiesel.org*
- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*

Domestic Content of Fuel

- More than 95%, based on current mix of input energy (coal, natural gas, nuclear, hydropower, and renewables) for electric power generation.

Fueling

- A cord and plug (conductive) or cord and paddle (inductive) system connects to a 120-volt, 240-volt, or higher-voltage electrical source. The connecting device may be located aboard the vehicle or in a fixed, off-vehicle location.
- Time needed for charging depends on voltage of the electrical source; temperature; and size, type, and remaining state-of-charge of the batteries.

Fuel Availability

- Most homes, government facilities, fleet garages, and businesses have adequate electrical capacity for charging. Special hookups or upgrades may be required.
- About 500 public charging facilities are available in selected areas mainly in southern California and Arizona.

Vehicle Experience

- More than 5,000 electric vehicles (EVs) are operating in the United States (most in California and the western United States). Few EVs are available outside California and Arizona.
- A few major automakers are producing EVs, with more planned for the future. EVs are also available as buses, bicycles, scooters, and neighborhood vehicles.

Operational Performance

- The range for OEM EVs is 50 to 130 miles. Variables include the vehicle's weight, engineering and design features, and type of battery.

- Weather extremes and use of accessories (such as heating and air conditioning) will reduce the range.
- Electric drivetrains are more energy efficient than internal combustion engines.
- OEM EVs can travel at the same speeds as conventional vehicles, and provide the same performance capabilities.

Maintenance and Reliability

- Different types of batteries (such as lead-acid, nickel-metal hydride, and lithium-ion) are available depending on the manufacturer and the vehicle.
- Service requirements are expected to be reduced. No tune-ups, oil changes, timing belts, water pumps, radiators, fuel injectors, or tailpipes are required.

Safety

- Auto suppliers may assist fleets with technical training. Some community colleges offer training for EV mechanics.
- OEM EVs must meet all the same vehicle safety standards as conventional vehicles.

Costs

- Battery pack replacement costs depend on the type of batteries and whether the vehicle is purchased or leased. Battery replacement is included in the price of leased vehicles.
- Initial commercial production automobiles are priced at \$15,000 to \$40,000. Tax incentives could significantly lower costs.
- Most manufacturers lease, but do not sell, EVs. Lease prices start at \$349 per month depending on vehicle and manufacturer.
- Electricity costs less per mile than gasoline; utility rates may vary.
- Installation of equipment at charging locations will involve additional expense.

Fuel Description:
Onboard rechargeable batteries power an electric motor.



For More Information, Contact:

- *Electric Vehicle Association of the Americas, 202-508-5995, e-mail: ev@evaa.org, www.evaa.org*
- *Electric Power Research Institute, 650-855-2984*
- *The Electric Auto Association, 510-814-1864, www.eaaev.org*
- *National Alternative Fuels Hotline, 800-423-1DOE*
- *Your local electric utility*

Ethanol

Fuel Description:

Liquid alcohol produced from grain or agricultural waste. E85 (a blend of 85% denatured ethanol and 15% gasoline) is used for light-duty applications; E95 (a blend of 95% denatured ethanol and 5% gasoline) is used for heavy-duty applications.



For More Information, Contact:

- *National Ethanol Vehicle Coalition, 573-635-8445 or 800-E85-8895*
- *Renewable Fuels Association, 202-289-3835, www.ethanolrfa.org*
- *American Biofuels Association, 703-522-3392*
- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*

Domestic Content of Fuel

- 100%

Fueling

- Ethanol vehicles are fueled the same as gasoline vehicles.

Fuel Availability

- Most fueling stations are located in the Midwest, but in all, more than 100 public E85 stations are available in 17 states.
- E95 is available only through bulk suppliers.

Vehicle Experience

- Available E85 vehicles are flexible-fuel, meaning that they can be operated on E85 (a blend of 85% ethanol and 15% gasoline), on gasoline, or on blends of the two.
- Some manufacturers are making entire production runs of selected vehicles ethanol compatible (flexible-fuel).
- In addition to LDVs, heavy-duty line-haul and medium-duty municipal trucks have been successfully demonstrated on E95. At this time, no heavy-duty engines are available from OEMs that operate on ethanol.
- The National Ethanol Vehicle Coalition estimates that 750,000 E85 vehicles were produced for MY 2000. That estimate excludes E85 vehicles already on the road.

Operational Performance

- Vehicles may require more frequent fueling depending on installed tank size and options. Some auto manufacturers are installing larger fuel tanks in the E85 vehicles, resulting in ranges similar to those of the gasoline models.
- Power, acceleration, payload, and cruising speed provided are comparable with those for equivalent conventional fuels.

Special Maintenance

Considerations

- Special lubricants may be required. Check the owners manual or consult with the manufacturer to ensure that the correct oil is used.
- Identify E85 as the fuel when ordering replacement parts.
- Maintenance assistance is available from local dealers; practices are very similar, if not identical, to those for conventionally fueled operations.

Safety

- Ethanol-fueled vehicles require the same fuel handling practices as conventionally fueled vehicles.

Costs

- E85 is sold in the Midwest at prices equivalent to those for mid-grade unleaded gasoline.
- Mass production of E85 compatible vehicles allows some OEMs to offer these vehicles at the same prices as comparable gasoline vehicles.

Domestic Content of Fuel

- About 90%, depending on world market price.

Fueling

- Fueling is the same as with conventional gasoline or diesel fuel.

Fuel Availability

- Methanol remains a qualified alternative fuel as defined by EPA, but it is not commonly used. Automakers have ceased supplying methanol-powered vehicles. A handful of methanol fueling stations exist in California, where some state fleet vehicles and school buses run on methanol.
- Individual users without access to public fueling stations may find methanol through bulk chemical suppliers in major cities.
- Methanol remains a good candidate to provide hydrogen for fuel cell vehicles, should they emerge in quantity in the auto market.

Vehicle Experience

- The number of methanol vehicles has declined substantially from the approximately 20,000 on U.S. roads in the early 1990s. Some estimates place the current number at 1,000 or perhaps even fewer.

Operational Performance

- Vehicles will require more frequent fueling than gasoline vehicles because of methanol's lower energy content.
- Power, acceleration, payload, and cruising speed are comparable with those for equivalent conventional fuels.

Maintenance and Reliability

- Use special lubricants available by direct order from supplier (significant cost premium over conventional motor oils).
- Use M85-compatible replacement parts (that is, identify M85 as fuel when ordering).

Safety

- Methanol-fueled vehicles require the same fuel handling practices as conventionally fueled vehicles.

Costs

- M85 fuel cost is equal to, or slightly higher than, that of premium-blend gasolines. In California, the major methanol supplier adjusts the price of methanol to the average cost for regular unleaded gasoline (after accounting for the difference in energy content).

Fuel Description:

Odorless clear liquid, produced from natural gas, coal, or biomass. M85 (a blend of 85% methanol and 15% gasoline) is for light-duty applications. M100 (pure methanol) is for heavy-duty applications.



For More Information, Contact:

- *American Methanol Institute, 202-467-5050, www.methanol.org*
- *California Energy Commission, 916-654-4292, www.cec.com*
- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*

Natural Gas

Fuel Description:

Extracted from underground reservoirs, composed primarily of methane.

Compressed natural gas (CNG) is compressed to 2,400–3,600 pounds per square inch in specially designed and constructed cylinders. Liquefied natural gas (LNG) is cooled to -260°F and stored in insulated cryogenic tanks.



For More Information, Contact:

- *Natural Gas Vehicle Coalition, 703-527-3022, www.ngvc.org*
- *American Public Gas Association, 703-532-3890, www.apga.org*
- *Gas Research Institute, 773-399-8100, www.gri.org*
- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*
- *Your local gas utility*

Domestic Content of Fuel

- Consumption is about 85% from domestic sources.

Fueling

- “Slow” fill (as long as 8 hours) and “quick” fill (3 to 5 minutes) are available for CNG. LNG (stored at -260°F) fueling times are comparable with those for gasoline or diesel fuels.

Fuel Availability

- CNG fueling stations are located in most major cities and in many rural areas; in all, nearly 1,300 fueling stations are available across the country.
- Public LNG stations are limited. LNG is available through several suppliers of cryogenic liquids.

Vehicle Experience

- Estimates indicate there are more than 75,000 natural gas vehicles, in the United States and more than 1 million worldwide.
- Auto manufacturers offer many types and styles of CNG vehicles.
- HDV manufacturers can install one of several available CNG or LNG engines in products they offer.
- Medium-duty and heavy-duty CNG vehicles operate in many applications including federal, state, and local government fleets; commercial fleets such as grocery stores; and package delivery fleets, such as United Parcel Service.
- One of every five new transit buses in the United States is powered by natural gas. Many school buses are natural gas-fueled.

Operational Performance

- Vehicle range for CNG and LNG depend on fuel storage capacity, but generally it is less than that of comparable gasoline or diesel vehicles.

- Power, acceleration, and cruising speeds are comparable with those of gasoline or diesel.
- Storage cylinder location and number may displace some payload capacity.

Maintenance and Reliability

- High-pressure tanks require periodic inspection and certification.
- Some fleets report 2 to 3 years longer service life and extended time between required maintenance. However, manufacturers and conversion companies recommend conventional maintenance intervals.

Safety

- Pressurized tanks have been designed to withstand severe impact, high external temperatures, and automotive environmental exposure. Design changes have resolved problems responsible for earlier in-service failures.
- It is important to fuel a natural gas-fueled vehicle in a well-ventilated area. Natural gas dissipates quickly in air relatively non-reactive when it's not contained.

Costs

- Fuel cost per gasoline-gallon-equivalent is less than that of gasoline.
- Conversion costs range from about \$2,500 to \$5,000 per LDV. The auto manufacturer's price premium can be \$1,500 to \$6,000.
- Incremental cost premiums for CNG buses and heavy-duty trucks are in the range of \$30,000 to \$50,000.
- Federal and other incentives can help offset some of the increase in vehicle acquisition costs.
- Fleets may need to purchase service and diagnostic equipment if access to commercial CNG/ LNG vehicle maintenance facilities is not available.

Domestic Content of Fuel

- Approximately 90%.

Fueling

- Comparable with that of gasoline or diesel vehicles; uses screw-on connection device.
- Tanks are filled to no more than 80% capacity (there is an automatic shutoff on the tanks), to allow for liquid expansion as the outside temperature rises.

Fuel Availability

- Propane is the most accessible of the liquid and gaseous alternative fuels in the United States.
- There are publicly accessible fueling stations in all states.

Vehicle Experience

- It's estimated that there are more than 350,000 on- and off-road propane-powered vehicles in the United States, and about 4 million worldwide.

Operational Performance

- Range on LPG is somewhat less than that of comparable gasoline-powered vehicles. Manufacturers often provide larger fuel tanks to compensate and allow vehicle ranges similar to gasoline.
- Power, acceleration, payload, and cruising speed are comparable to those obtained with an equivalent internal combustion engine.

Maintenance and Reliability

- Some fleets report service lives that are 2 to 3 years longer, as well as extended intervals between required maintenance sessions. However, manufacturers and conversion companies recommend conventional maintenance intervals.

Safety

- Adequate ventilation is important for fueling a propane-fueled vehicle. Fueling in a closed-in space can be hazardous, but proper air circulation dissipates the fumes quickly.
- Propane tanks are 20 times more puncture resistant than gasoline tanks, and can withstand high impact.

Costs

- Propane vehicle operating costs in fleets typically range from 5% to 30% less than those of gasoline.
- Fueling station cost is similar to that for a comparably sized gasoline dispensing system.
- Service and diagnostic equipment will be required if access to commercial propane vehicle maintenance facilities is not available.
- Factory-installed LDV conversion costs about \$2,500 in addition to the conventional vehicle base price; non-factory conversions also average about \$2,500.

Fuel Description:

Liquefied petroleum gas, or LPG (commonly called propane), is a liquid mixture of at least 90% propane, and up to 2.5% butane and higher hydrocarbons. The balance is ethane and propylene. It is a by-product of natural gas processing or petroleum refining.



For More Information, Contact:

- *National Propane Gas Association, 630-515-0600, www.npga.org*
- *Propane Vehicle Council, 202-530-0479*
- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*

Advanced Technology Vehicles

Description:

Certain vehicle technologies do not qualify for EPA Act credits, but may play a significant part in reducing petroleum use and exhaust emissions. Among them are hybrid-electric vehicles, which are already available commercially; and fuel cell vehicles, which are still development.



For More Information, Contact:

- *National Alternative Fuels Hotline, 800-423-1DOE, www.afdc.doe.gov*
- *Office of Transportation Technologies, www.ott.doe.gov*
- *Hydrogen Information Network, www.eren.doe.gov/hydrogen*
- *Electric Vehicle Association of the Americas, 202-508-5995, e-mail: ev@evaa.org, www.evaa.org*
- *California Fuel Cell Partnership, 916-371-2870, www.fuelcellpartnership.org*

Hybrid Electric Vehicle (HEV) Description:

- HEVs are powered by two energy sources—an energy conversion unit (such as an internal combustion engine or fuel cell) and an energy storage device (such as batteries or ultra capacitors). The energy conversion unit may be powered by gasoline, methanol, CNG, hydrogen, or an other alternative fuel. HEVs have the potential to be two to three times more fuel efficient than conventional vehicles.
- HEVs can have either a parallel or a series design. In a parallel design, the energy conversion unit and electric propulsion system are connected directly to the vehicle's mechanical drive train. The primary engine is used for highway driving; the electric motor provides added power during hill climbs, acceleration, and other periods of high demand. In a series design, the primary engine is connected to a generator that produces electricity. The electricity charges batteries and drives an electric motor that powers the wheels.
- Two of the earliest entries in the commercial market for HEVs are the Honda Insight and the Toyota Prius. Both are economical subcompacts.

Fuel Cell Vehicle Description

- A fuel cell converts the chemical energy of a fuel into usable electricity and heat without combustion as an intermediate step.
- A vehicle powered by a fuel cell can be highly efficient and can reduce emissions significantly. Because hydrogen reacts with oxygen to produce electricity and has only water vapor and heat as by-products, it is the optimal fuel for powering fuel cells. Storing hydrogen onboard a fuel cell vehicle (FCV) greatly simplifies the fuel system design

and results in a greater energy efficient system because onboard fuel processing is unnecessary. Hydrogen is normally a gas, so a relatively large volume is required to contain enough energy to provide the driving range we expect from today's automobiles. Currently, two methods of storing hydrogen onboard a vehicle are receiving the most attention: compressed gas in storage tanks at high pressure or liquid hydrogen in insulated storage tanks at low temperature and pressure. Research and development of chemical storage systems using metal hydride compounds and advanced carbon storage media are also under way. Researchers are also investigating the use of liquid fuels such as methanol or gasoline as sources of hydrogen. This approach solves the problems associated with storing hydrogen, but requires additional equipment to chemically strip the hydrogen from the liquid fuel.

- Fuel cell technology is in development by automakers in the U.S., Europe, and Asia, but FCVs are not yet available commercially.

Operational Performance

- HEVs and FCVs are being developed to meet the performance expectations of today's consumers. FCVs are extremely quiet and have very little vibration.

Safety and Costs

- The goal is to develop these vehicles with levels of safety, comfort, and cost comparable to those of a conventional vehicle. Meeting consumers' cost expectations, especially when the vehicles are introduced, will be difficult. But incentives, rebates, and possible auto manufacturer price adjustments will help reduce the purchase price of these vehicles.

Metropolitan Statistical Areas Covered by EPA Act

DOE has defined covered MSA/CMSA areas by the 1980 U.S. Census population figures and by the 1990 U.S. Census MSA/CMSA area definitions. Covered MSA/CMSA areas are displayed in bold type followed by a list of covered counties.

(P) means that only part of the county is covered by EPA Act. A list of covered cities in each partial county is located in Appendix A. You may also use the easy, interactive Clean Cities Alternative Fuel Vehicle Fleet Buyer's Guide at <http://www.fleets.doe.gov> or call the National Alternative Fuels Hotline at 800-423-1DOE to determine whether you are in an area covered by EPA Act.

Alabama

Birmingham

Blount
Jefferson
St. Clair
Shelby

Columbus, GA-AL

Russell

Mobile

Baldwin
Mobile

Montgomery

Autauga
Elmore
Montgomery

Arizona

Las Vegas, NV-AZ

Mohave

Phoenix

Maricopa
Pinal

Tucson

Pima

Arkansas

Little Rock-North

Little Rock

Faulkner
Lonoke
Pulaski
Saline

Memphis, TN-AR-MS

Crittenden

California

Bakersfield

Kern

Fresno

Fresno
Madera

Los Angeles-Riverside-Orange County

Los Angeles
Orange
Riverside
San Bernardino
Ventura

Modesto

Stanislaus

Sacramento-Yolo

El Dorado
Placer
Sacramento
Yolo

Salinas

Monterey

San Diego

San Diego

San Francisco-Oakland-San Jose

Alameda
Contra Costa
Marin
Napa
San Francisco
San Mateo
Santa Clara
Santa Cruz
Solano
Sonoma

Stockton-Lodi

San Joaquin

Santa Barbara-Santa Maria-Lompoc

Santa Barbara

Colorado

Colorado Springs

El Paso

Denver-Boulder-Greeley

Adams
Arapahoe

Boulder
Denver
Douglas
Jefferson
Weld

Connecticut

Boston-Worcester-Lawrence, MA-NH

Windham (P)

Hartford

Hartford (P)
Litchfield (P)
Middlesex (P)
New London (P)
Tolland (P)
Windham (P)

New London-Norwich, CT-RI

New London (P)
Middlesex (P)
Windham (P)

New York-Northern New Jersey-Long Island, NY-NJ-CT-PA

Fairfield (P)
Litchfield (P)
Middlesex (P)
New Haven (P)

Delaware

Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD

New Castle

District Of Columbia

Washington-Baltimore, DC-MD-VA-WV

Washington, DC

Florida

Daytona Beach

Flagler
Volusia

Jacksonville

Clay
Duval
Nassau
St. Johns

Lakeland-Winter Haven

Polk

Melbourne-Titusville-Palm Bay

Brevard

Miami-Ft. Lauderdale

Broward
Dade

Orlando

Lake
Orange
Osceola
Seminole

Pensacola

Escambia
Santa Rosa

Tampa-St. Petersburg-Clearwater

Hernando
Hillsborough
Pasco
Pinellas

West Palm Beach-Boca Raton-Delray Beach

Palm Beach

Georgia

Atlanta

Barrow
Bartow
Carroll

Cherokee
Clayton
Cobb
Coweta
DeKalb
Douglas
Fayette
Forsyth
Fulton
Gwinnett
Henry
Newton
Paulding
Pickens
Rockdale
Spalding
Walton

Augusta-Aiken, GA-SC

Columbia
Richmond

Chattanooga, TN-GA

Catoosa
Dade
Walker

Columbus, GA-AL

Chattahoochee
Harris
Muscogee

Macon

Bibb
Houston
Jones
Peach
Twiggs

Hawaii

Honolulu

Honolulu

Idaho

Boise City

Ada
Canyon

Metropolitan Statistical Areas Covered by EPA Act

Illinois

Chicago-Gary-Kenosha, IL-IN-WI

Cook
DeKalb
Dupage
Grundy
Kane
Kankakee
Kendall
Lake
McHenry
Will

Davenport-Moline-Rock Island, IA-IL

Henry
Rock Island

Peoria-Pekin

Peoria
Tazewell
Woodford

Rockford

Boone
Ogle
Winnebago

St. Louis, MO-IL

Clinton
Jersey
Madison
Monroe
St. Clair

Indiana

Chicago-Gary-Kenosha, IL-IN-WI

Lake
Porter

Cincinnati-Hamilton, OH-KY-IN

Dearborn
Ohio

Ft. Wayne

Adams
Allen
DeKalb
Huntington
Wells
Whitley

Evansville-Henderson, IN-KY

Posey
Vanderburgh
Warrick

Louisville, KY-IN

Clark
Floyd
Harrison
Scott

Indianapolis

Boone
Hamilton
Hancock
Hendricks
Johnson
Madison
Marion
Morgan
Shelby

Iowa

Davenport-Moline-Rock Island, IA-IL

Scott

Des Moines

Dallas
Polk
Warren

Omaha, NE-IA

Pottawattamie

Kansas

Kansas City, MO-KS

Johnson
Leavenworth
Miami
Wyandotte

Wichita

Butler
Harvey
Sedgwick

Kentucky

Cincinnati-Hamilton, OH-KY-IN

Boone
Campbell
Gallatin
Grant
Kenton
Pendleton

Evansville-Henderson, IN-KY

Henderson

Huntington-Ashland, WV-KY-OH

Boyd
Greenup

Lexington

Bourbon
Clark
Clark
Fayette
Jessamine
Madison
Scott
Woodford

Louisville, KY-IN

Bullitt
Jefferson
Oldham

Louisiana

Baton Rouge

(Parishes)
East Baton Rouge
Livingston
West Baton Rouge

New Orleans

(Parishes)
Jefferson
Orleans
Plaquemines
St. Bernard
St. Charles
St. James
St. John the Baptist
St. Tammany

Shreveport-Bossier City

(Parishes)
Bossier
Caddo
Webster

Maine

Boston-Lawrence-Worcester, MA-NH

York (P)

Maryland

Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD

Cecil

Washington-Baltimore, DC-MD-VA-WV

Anne Arundel
Baltimore
Baltimore City
Calvert
Carroll
Charles
Frederick

Harford
Howard
Montgomery
Prince George's
Queen Anne's
Washington

Massachusetts

Boston-Lawrence-Worcester, MA-NH

Bristol (P)
Essex (P)
Hampden (P)
Middlesex (P)
Norfolk (P)
Plymouth (P)
Suffolk (P)
Worcester (P)

Springfield

Franklin (P)
Hampden (P)
Hampshire (P)

Providence-Fall River-Warwick, RI-MA

Bristol (P)

Michigan

Detroit-Ann Arbor-Flint

Genesee
Lapeer
Lenawee
Livingston
Macomb
Monroe
Oakland
St. Clair
Wayne
Washtenaw

Grand Rapids-Muskegon-Holland

Allegan
Kent
Muskegon
Ottawa

Kalamazoo-Battle Creek

Calhoun
Kalamazoo
Van Buren

Lansing-East Lansing

Clinton
Eaton
Ingham

Saginaw-Bay City-Midland

Bay
Midland
Saginaw

Minnesota

Duluth-Superior, MN-WI

St. Louis

Minneapolis-St. Paul, MN-WI

Anoka
Carver
Chisago
Dakota
Hennepin
Isanti
Ramsey
Scott
Sherburne
Washington
Wright

Mississippi

Jackson

Hinds
Madison
Rankin

Memphis, TN-AR-MS

DeSoto

Missouri

Kansas City, MO-KS

Cass
Clay
Clinton
Jackson
Lafayette
Platte
Ray

St. Louis, MO-IL

Franklin
Jefferson
Lincoln
St. Charles
St. Louis City
St. Louis County
Warren

Nebraska

Omaha, NE-IA

Cass
Douglas
Sarpy
Washington

Metropolitan Statistical Areas Covered by EPA Act

Nevada

Las Vegas, NV-AZ

Clark
Nye

New Hampshire

Boston-Worcester-Lawrence, MA-NH

Hillsborough (P)
Merrimack (P)
Rockingham (P)
Strafford (P)

New Jersey

New York-Northern New Jersey-Long Island, NY-NJ-CT-PA

Bergen
Essex
Hudson
Hunterdon
Mercer
Middlesex
Monmouth
Morris
Ocean
Passaic
Somerset
Sussex
Union
Warren

Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD

Atlantic
Burlington
Camden
Cape May
Cumberland
Gloucester
Salem

New Mexico

Albuquerque

Bernalillo
Sandoval
Valencia

New York

Albany-Schenectady-Troy

Albany
Montgomery
Rensselaer
Saratoga
Schenectady
Schoharie

Binghamton

Broome
Tioga

Buffalo-Niagara Falls

Erie
Niagara

New York-Northern

New Jersey-Long Island, NY-NJ-CT-PA

Bronx
Dutchess
Kings
Nassau
New York
Orange
Putnam
Queens
Richmond
Rockland
Suffolk
Westchester

Rochester

Genesee
Livingston
Monroe
Ontario
Orleans
Wayne

Syracuse

Cayuga
Madison
Onondaga
Oswego

Utica-Rome

Herkimer
Oneida

North Carolina

Charlotte-Gastonia-

Rock Hill, NC-SC

Cabarrus
Gaston
Lincoln
Mecklenburg
Rowan
Union

Greensboro-Winston-Salem-High Point

Alamance
Davidson
Davie
Forsyth
Guilford
Randolph

Stokes
Yadkin

Hickory-

Morgantown-Lenoir

Alexander
Burke
Caldwell
Catawba

Norfolk-Virginia Beach-Newport News, VA-NC

Currituck

Raleigh-Durham

Chatham
Durham
Franklin
Johnston
Orange
Wake

Ohio

Canton-Massillon

Carroll
Stark

Cincinnati-Hamilton, OH-KY-IN

Brown
Butler
Clermont
Hamilton
Warren

Cleveland-Akron

Ashtabula
Cuyahoga
Geauga
Lake
Lorain
Medina
Portage
Summit

Columbus

Delaware
Fairfield
Franklin
Licking
Madison
Pickaway

Dayton-Springfield

Clark
Greene
Miami
Montgomery

Huntington-Ashland, WV-KY-OH

Lawrence

Toledo

Fulton
Lucas
Wood

Youngstown-Warren

Columbiana
Mahoning
Trumbull

Oklahoma

Oklahoma City

Canadian
Cleveland
Logan
McClain
Oklahoma
Pottawatomie

Tulsa

Creek
Osage
Rogers
Tulsa
Wagoner

Oregon

Eugene-Springfield

Lane

Portland-Salem, OR-WA

Clackamas
Columbia
Marion
Multnomah
Polk
Washington
Yamhill

Pennsylvania

Allentown-

Bethlehem-Easton

Carbon
Lehigh
Northampton

Harrisburg-Lebanon-Carlisle

Cumberland
Dauphin
Lebanon
Perry

Erie

Erie

Johnstown

Cambria
Somerset

Lancaster

Lancaster

New York-Northern

New Jersey-Long Island, NY-NJ-CT-PA

Pike

Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD

Bucks
Chester
Delaware
Montgomery
Philadelphia

Pittsburgh

Allegheny
Beaver
Butler
Fayette
Washington
Westmoreland

Reading

Berks

Scranton-Wilkes Barre-Hazleton

Columbia
Lackawanna
Luzerne
Wyoming

York

York

Puerto Rico

San Juan-Caguas-

Arecibo

(Municipio)
Aguas Buenas
Arecibo
Barceloneta
Bayamon
Caguas
Camuy
Canovanas
Carolina
Catano
Cayey
Ceiba
Cidra
Comerio
Corozal
Dorado

Metropolitan Statistical Areas Covered by EPA Act

Fajardo
Florida
Guaynabo
Gurabo
Hatillo
Humacao
Juncas
Las Piedras
Loiza
Luquillo
Manati
Morovis
Naguabo
Naranjito
Rio Grande
San Juan
San Lorenzo
Toa Alta
Toa Baja
Trujillo Alto
Vega Alta
Vega Baja
Yabucoa

Rhode Island

New London-Norwich, CT-RI

Washington (P)

Providence-Fall River-Warwick, RI-MA

Bristol (P)
Kent (P)
Newport (P)
Providence (P)
Washington (P)

South Carolina

Augusta-Aiken, GA-SC

Aiken
Edgefield

Charleston-North Charleston

Berkeley
Charleston
Dorchester

Charlotte-Gastonia-Rock Hill, NC-SC

York

Columbia

Lexington
Richland

Greenville-Spartanburg-Anderson

Anderson
Cherokee
Greenville
Pickens
Spartanburg

Tennessee

Chattanooga, TN-GA

Hamilton

Johnson City-Kingsport-Bristol, TN-VA

Carter
Hawkins
Sullivan
Unicoi
Washington

Knoxville

Anderson
Blount
Knox
Loudon
Sevier
Union

Memphis, TN-AR-MS

Fayette
Shelby
Tipton

Nashville

Cheatham
Davidson
Dickson
Robertson
Rutherford
Sumner
Williamson
Wilson

Texas

Austin-San Marcos

Bastrop
Caldwell
Hays
Travis
Williamson

Beaumont-Port Arthur

Hardin
Jefferson
Orange

Corpus Christi

Nueces
San Patricio

Dallas-Fort Worth

Collin
Dallas
Denton
Ellis
Henderson
Hood
Hunt
Johnson
Kaufman
Parker
Rockwall
Tarrant

El Paso

El Paso

Houston-Galveston-Brazoria

Brazoria
Chambers
Fort Bend
Galveston
Harris
Liberty
Montgomery
Waller

McAllen-Edinburg-Mission

Hidalgo

San Antonio

Bexar
Comal
Guadalupe
Wilson

Utah

Salt Lake City-Ogden

Davis
Salt Lake
Weber

Virginia

Johnson City-Kingsport-Bristol, TN-VA

Bristol City
Scott
Washington

Norfolk-Virginia Beach-Newport News, VA-NC

Chesapeake City
Gloucester
Hampton City
Isle of Wight
James City
Mathews
Newport News City
Norfolk City
Poquoson City
Portsmouth City
Suffolk City
Virginia Beach City
Williamsburg City
York

Richmond-Petersburg

Charles City
Chesterfield
Colonial Heights City
Dinwiddie
Goochland
Hanover
Henrico
Hopewell City
New Kent
Petersburg City
Powhatan
Prince George
Richmond City

Washington-Baltimore, DC-MD-VA-WV

Alexandria City
Arlington
Clarke
Culpeper
Fairfax
Fairfax City
Falls Church City
Fauquier
Fredericksburg City
King George
Loudoun
Manassas City
Manassas Park City
Prince William
Spotsylvania
Stafford
Warren

Washington

Portland-Salem, OR-WA

Clark

Seattle-Tacoma-Bremerton

Island
King
Kitsap
Pierce
Snohomish
Thurston

Spokane

Spokane

West Virginia

Charleston

Kanawha
Putnam

Huntington-Ashland, WV-KY-OH

Cabell
Wayne

Washington-Baltimore, DC-MD-VA-WV

Berkeley
Jefferson

Wisconsin

Appleton-Oshkosh-Neenah

Calumet
Outagamie
Winnebago

Chicago-Gary-Kenosha, IL-IN-WI

Kenosha

Duluth-Superior, MN-WI

Douglas

Madison

Dane

Milwaukee-Racine

Milwaukee
Ozaukee
Racine
Washington
Waukesha

Minneapolis-St. Paul, MN-WI

Pierce
St. Croix

Appendix: Cities in Partial Counties

Connecticut

Fairfield County

Bethel
Bridgeport
Brookfield
Danbury
Darien
Easton
Fairfield
Greenwich
Monroe
New Canaan
New Fairfield
Newtown
Norwalk
Redding
Ridgefield
Shelton
Sherman
Stamford
Stratford
Trumbull
Weston
Westport
Wilton

Hartford County

Avon
Berlin
Bloomfield
Bristol
Burlington
Canton
East Granby
East Hartford
East Windsor
Enfield
Farmington
Glastonbury
Granby
Hartford
Manchester
Marlborough
New Britain
Newington
Plainville
Rocky Hill
Simsbury
South Windsor
Southington
Suffield
West Hartford
Wethersfield
Windsor
Windsor Locks

Litchfield County

Barkhamsted
Bethlehem
Bridgewater
Harwinton
New Hartford
New Milford
Plymouth
Roxbury
Thomaston
Washington
Watertown
Winchester
Woodbury

Middlesex County

Clinton
Cromwell
Durham
East Haddam
East Hampton
Haddam
Killingworth
Middlefield
Middletown
Old Saybrook
Portland

New Haven County

Ansonia
Beacon Falls
Bethany
Branford
Cheshire
Derby
East Haven
Guilford
Hamden
Madison
Meriden
Middlebury
Milford
Naugatuck
New Haven
North Branford
North Haven
Orange
Oxford
Prospect
Seymour
Southbury
Wallingford
Waterbury
West Haven
Wolcott
Woodbridge

New London County

Bozrah
Colchester
East Lyme
Franklin
Griswold
Groton
Lebanon
Ledyard
Lisbon
Montville
New London
North Stonington
Norwich
Old Lyme
Preston
Salem
Sprague
Stonington
Waterford

Tolland County

Andover
Bolton
Columbia
Coventry
Ellington
Hebron
Mansfield
Somers
Stafford
Tolland
Vernon
Willington

Windham County

Ashford
Canterbury
Chaplin
Plainfield
Thompson
Windham

Massachusetts

Bristol County

Acushnet
Attleboro
Berkley
Dartmouth
Dighton
Easton
Fairhaven
Fall River
Freetown
Mansfield
New Bedford
North Attleborough

Norton
Raynham
Rehoboth
Seekonk
Somerset
Swansea
Taunton
Westport

Essex County

Amesbury
Andover
Beverly
Boxford
Danvers
Essex
Georgetown
Gloucester
Groveland
Hamilton
Haverhill
Ipswich
Lawrence
Lynn
Lynnfield
Manchester
Marblehead
Merrimac
Methuen
Middleton
Nahant
Newbury
Newburyport
North Andover
Peabody
Rockport
Rowley
Salem
Salisbury
Saugus
Swampscott
Topsfield
Wenham
West Newbury

Franklin County

Sunderland

Hampden County

Agawam
Chicopee
East Longmeadow
Hampden
Holyoke
Longmeadow
Ludlow
Monson

Montgomery
Palmer
Russell
Southwick
Springfield
West Springfield
Westfield
Wilbraham

Hampshire County

Amherst
Belchertown
Easthampton
Granby
Hadley
Hatfield
Huntington
Northampton
South Hadley
Southampton
Ware
Williamsburg

Middlesex County

Acton
Arlington
Ashby
Ashland
Ayer
Bedford
Belmont
Billerica
Boxborough
Burlington
Cambridge
Carlisle
Chelmsford
Concord
Dracut
Dunstable
Everett
Framingham
Groton
Holliston
Hopkinton
Hudson
Lexington
Lincoln
Littleton
Lowell
Malden
Marlborough
Maynard
Medford
Melrose
Natick
Newton

Appendix: Cities in Partial Counties

North Reading
Pepperell
Reading
Sherborn
Shirley
Somerville
Stoneham
Stow
Sudbury
Tewksbury
Townsend
Tyngsborough
Wakefield
Waltham
Watertown
Wayland
Westford
Weston
Wilmington
Winchester
Woburn

Norfolk County

Avon
Bellingham
Braintree
Brookline
Canton
Cohasset
Dedham
Dover
Foxborough
Franklin
Holbrook
Medfield
Medway
Millis
Milton
Needham
Norfolk
Norwood
Plainville
Quincy
Randolph
Sharon
Stoughton
Walpole
Wellesley
Westwood
Weymouth
Wrentham

Plymouth County

Abington
Bridgewater
Brockton
Carver

Duxbury
East Bridgewater
Halifax
Hanover
Hanson
Hingham
Hull
Kingston
Lakeville
Marion
Marshfield
Mattapoisett
Middleborough
Norwell
Pembroke
Plymouth
Plympton
Rochester
Rockland
Scituate
Wareham
West Bridgewater
Whitman

Suffolk County

Chelsea
Revere
Winthrop

Worcester County

Ashburnham
Auburn
Barre
Berlin
Blackstone
Bolton
Boylston
Brookfield
Charlton
Clinton
Douglas
Dudley
East Brookfield
Fitchburg
Gardner
Grafton
Harvard
Holden
Hopedale
Lancaster
Leicester
Leominster
Lunenburg
Mendon
Milford
Millbury
Millville
North Brookfield

Northborough
Northbridge
Oakham
Oxford
Paxton
Princeton
Rutland
Shrewsbury
Southborough
Southbridge
Spencer
Sterling
Sturbridge
Sutton
Templeton
Upton
Uxbridge
Webster
West Boylston
West Brookfield
Westborough
Westminster
Winchendon
Worcester

Maine

York County

Berwick
Eliot
Kittery
South Berwick
York

New Hampshire

Hillsborough County

Amherst
Bedford
Brookline
Goffstown
Greenville
Hollis
Hudson
Litchfield
Manchester
Mason
Merrimack
Milford
Mont Vernon
Nashua
New Ipswich
Pelham
Weare
Wilton

Merrimack County

Allenstown
Hooksett

Rockingham County

Atkinson
Auburn
Brentwood
Candia
Chester
Danville
Derry
East Kingston
Epping
Exeter
Fremont
Greenland
Hampstead
Hampton
Hampton Falls
Kensington
Kingston
Londonderry
New Castle
Newfields
Newington
Newmarket
Newton
North Hampton
Plaistow
Portsmouth
Raymond
Rye
Salem
Sandown
Seabrook
South Hampton
Stratham
Windham

Strafford County

Barrington
Dover
Durham
Farmington
Lee
Madbury
Milton
Rochester
Rollinsford
Somersworth

Rhode Island

Bristol County

Barrington
Bristol
Warren

Kent County

Coventry
East Greenwich
Warwick
West Greenwich
West Warwick

Newport County

Jamestown
Little Compton
Tiverton

Providence County

Burrillville
Central Falls
Cranston
Cumberland
East Providence
Foster
Glocester
Johnston
Lincoln
North Providence
North Smithfield
Pawtucket
Providence
Scituate
Smithfield
Woonsocket

Washington County

Charlestown
Exeter
Hopkinton
Narragansett
North Kingstown
Richmond
South Kingstown
Westerly

Glossary of Terms

The terms alternative fuel, non-petroleum fuel, domestic fuel, and clean fuel are often used interchangeably, as are clean fuel vehicle (CFV) and alternative fuel vehicle (AFV). In this publication, these terms are defined in accordance with the Energy Policy Act (EPA) of 1992 and the 1990 Clean Air Act Amendments (CAAA):

Alternative Fuel – as defined by EPA, alternative fuels are methanol, denatured ethanol, and other alcohols; mixtures containing 85% or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquefied petroleum gas; hydrogen; coal-derived liquid fuels; fuels (other than alcohol) derived from biological material, such as pure biodiesel; and electricity. "P-Series" fuels have recently been added to this list.

Alternative Fuel Provider – a fuel provider (or any affiliate or business unit under its control) is an alternative fuel provider if its principal business is producing, storing, refining, processing, transporting, distributing, importing, or selling (at wholesale or retail) any alternative fuel (other than electricity), or generating, transmitting, importing, or selling (at wholesale or retail) electricity; or if that fuel provider produces, imports, or produces and imports (in combination) an average of 50,000 barrels per day of petroleum and 30% (a substantial portion) or more of its gross annual revenues are derived from producing alternative fuels. A fuel provider is not covered if it transforms or consumes alternative fuels to make a product that is not an alternative fuel.

Alternative Fuel Vehicle (AFV) – as defined by EPA, any dedicated or multi-fueled vehicle designed to operate on at least one alternative fuel (e.g., bi-fuel and flexible-fuel vehicles).

Bi-Fuel Vehicle – a vehicle with two separate fuel systems designed to run either on an alternative fuel or on gasoline or diesel, but uses only one fuel at a time. Bi-fuel vehicles are referred to as "dual-fuel" vehicles in CAAA and EPA. **Clean Fuel** – any fuel or power source that is used to certify a vehicle to the LEV, ILEV, ULEV, or ZEV standard.

Clean Fuel Vehicle (CFV) – a vehicle that is certified to the LEV, ILEV, ULEV, or ZEV standard and operates with one or more clean fuels on which the vehicle was certified.

Consolidated Metropolitan Statistical Area (CMSA) – an urban center and surrounding areas, as currently defined by the U.S. Bureau of the Census, with a population greater than 250,000.

Converted or Conversion Vehicle – a vehicle designed to operate on gasoline or diesel that has been modified or altered to run on an alternative fuel.

Dedicated Vehicle – a vehicle that operates solely on one fuel. Generally, a dedicated vehicle has superior emissions and performance because its design has been optimized for single fuel operation.

Domestic Fuel – as defined by EPA, Section 301, fuel that is derived from resources within the United States, its possessions and commonwealths, and Canada and Mexico (the two nations currently in a free trade agreement with the United States).

Dual-Fuel Vehicle (CAAA definition) – a vehicle with two separate fuel systems, designed to run either on an alternative fuel or on gasoline or diesel, but using only one fuel at a time.

Dual-Fuel Vehicle (EPA definition) – a vehicle designed to operate on a combination of an alternative fuel and a conventional fuel. This includes both vehicles using a mixture of gasoline or diesel and an alternative fuel (usually ethanol or methanol) in one fuel tank, commonly called flexible-fuel vehicles; and vehicles capable of operating on either an alternative fuel (usually compressed natural gas or propane), or a conventional fuel, using two separate fuel systems; these are commonly called bi-fuel vehicles.

Flexible-Fuel Vehicle (FFV) – a vehicle with a single tank, powered by any mixture of gasoline and either ethanol or methanol.

GVWR - Gross vehicle weight rating.

OEM – original equipment manufacturer.

P-Series Fuels – fuels designed by the Pure Fuel Corporation to run in E85/gasoline flexible-fuel vehicles; recently designated as alternative fuels by DOE.

Petroleum Fuel – gasoline and diesel fuel.

Ultra-Low-Emission Vehicle (ULEV) – a vehicle that produces lower levels of exhaust emissions than an LEV. ULEV credits can also be banked within the CMSA.

Vehicle Emission Standards – ratings such as Low-Emission Vehicle (LEV), Zero Emission Vehicle (ZEV), etc. See chart below. Generally, such designations clarify vehicles in terms of maximum emissions of exhaust gases such as CO, HC, and NOx. Since LEV was first defined in federal Clean Air legislation, several variations have been added to both by EPA and the California Air Resources Board.

Vehicle Weight Definitions – in trucks, ratings such as Light-Duty Truck (LDT), Medium-Duty Vehicle (MDV), etc. See chart left. Generally, a vehicle classification system based on Gross Vehicle Weight Rating. Such definitions are used extensively in fuel-related laws and regulations both at the federal and state level. The Motor Vehicle Manufacturers Association uses its own classification system independently. Aside from trucks, automobiles under 8,500 GVWR are classified as Light-Duty Vehicles.

VEHICLE WEIGHT DEFINITIONS (TRUCKS)				
GVWR Range	MVMA* Class	EPA** Class	CARB*** Class	Example
0-6,000	1	LDT1	Light Duty Truck	Compact pickup, minivan, van, jeep, 4wd
6,001-8,500		LDT2		Full-size pickup, full-size van
8,501-10,000	2	LHDV	Medium Duty Vehicle	Large pickup, large van
10,001-14,000	3			Shuttle bus, motor home, tow truck
14,001-16,000	4			Small 2-axle truck
16,001-20,000	5			Step van
20,001-26,000	6	MHDV	Medium Heavy Duty Vehicle	School bus
26,001-33,000	7			Transit bus, full-size two axle truck
33,001-46,000	8a			Three-axle truck
46,001-up	8b	HHDV	Heavy Heavy Duty Vehicle	Semi-trailer, double-trailer rigs

* Motor Vehicle Manufacturers Association
 ** U.S. Environmental Protection Agency
 *** California Air Resources Board

VEHICLE EMISSION STANDARDS				
Abbr.	Designation	CARB	US EPA	Notes
AT-PZEV	Advanced Technology Partial Zero Emission Vehicle	X		More stringent than CARB's PZEV; cleaner through engine's "full cycle"
ILEV	Inherently Low Emission Vehicle		X	Voluntary federal standard; usually met by dedicated AFVs including dual-fuel
LEV	Low Emission Vehicle	X	X	Least stringent of all such standards; defined separately by EPA and CARB
NLEV	National Low Emission Vehicle		X	Voluntary; applies to manufacturers' overall sales, not individual cars
PZEV	Partial Zero Emission Vehicle	X		Allows manufacturers to meet ZEV rules partly with non-electric vehicles
SULEV	Super Ultra-low Emission Vehicle	X		CARB designation only; more stringent than ULEV standards
TIER 1			X	Current minimum federal emission standard
TLEV	Transitional Low Emission Vehicle		X	Voluntary standard that applied only to 1997 model year
ULEV	Ultra-low Emission Vehicle	X	X	More stringent than LEV; earns credits both for buyers and manufacturers
ZEV	Zero Emission Vehicle	X	X	Usually applies to electric vehicles, future fuel cell cars may qualify



Office of Transportation Technologies

Alternative Fuel Vehicle Fleet Buyer's Guide

www.fleets.doe.gov

The U.S. Department of Energy (DOE) has developed a Web-based guide to help take the guesswork out of acquiring AFVs. The AFV Fleet Buyer's Guide will enable fleet managers, or anyone interested in AFVs, to walk through a step-by-step process that will help them make informed AFV purchase decisions.

This guide will help you determine whether EPCa applies to your fleet, and if so, how you can comply with the requirements. It also includes a comprehensive listing of available AFVs, dealers, refueling and recharging sites, industry contacts, incentives, and more.

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